

Chinese Moso Bamboo: Its Importance

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Abstract

Moso bamboo is the most important bamboo species in China, where it covers about 3 million ha, or 30,000 km² (7.413 million acres, or 11,580 miles²). It is the main species for bamboo timber and bamboo shoot production and plays a very important role for the ecological environment. The southeast of US is a suitable area to develop Moso bamboo plantations.

“Mao Zhu” is the Chinese name of Moso bamboo, meaning “hairy bamboo”. Its Latin name is *Phyllostachys heterocycla* var. *pubescens* or *Ph. edulis*. *Edulis* means edible. It is the most important bamboo species in China and the third most important plant species for timber production next to *Pinus massoniana* and *Cunninghamia lanceolata* (“Chinese Fir”). There are 4.2 million ha (10.3 million acres) of bamboo forest and Moso bamboo alone covers about 3 million ha, (7.413 million acres), which is about 2% of the total Chinese forest area. Table 1 shows that in the past 30 years Moso bamboo forest resource has doubled.

Table 1 · Moso Bamboo Resource in China (1975-1998)

Year	Area (mil. ha)	Culm (bil.)	Ton (mil.)
1957	1.50	2.88	43.13
1965	1.60	2.92	43.82
1975	2.00	3.54	53.13
1981	2.49	3.58	53.69
1988	2.50	4.00	59.97
1993	2.60	5.00	74.93
1998	2.92	5.84	87.66

Note: 1 million ha = 2.471 million acres

1 metric tonne = 0.98 U.S. tons

Distribution

Bamboo is the fastest growing plant in the world. Moso bamboo can grow up to 119cm (47 inches) in 24 hours and 24 m (78½ feet) high in 40 to 50 days. Its culm diameter at 1.3 m (51 inches) above the ground is 6 to 18cm (2.3 to 7 inches). The natural habitat of *P. pubescens* extends approximately 23°30' to 32°20' N and 104°30' to 122° E. Those provinces are Fujian, Hunan, Zhejiang, Jiangxi, Anhui, Hubei, Sichuan, Jiangsu, Guizhou, Guangdong, Guangxi, Yunnan and Shan'xi. The central forest area of Moso bamboo lies between 25° to 30° N and 110° to 122° E, 81.2% of the total Moso bamboo forest area is in province Fujian, Hunan, Zhejiang and Jiangxi. Large areas of Moso bamboo forest are called “Bamboo Sea”. One of them is the bamboo sea in Anji, Zhejiang province,

which covers more than 10,000 ha (24,710 acres). The Anji Bamboo Botanic Garden and Museum is situated near this bamboo sea and has about 300 bamboo species in its collection.

Hardiness

Moso bamboo is located in hardness zones 7, 8, 9 and 10. Zones 7, 8, 9 and 10 have mean annual minimum temperature -17.7 to -12.3°C (0.14 to 9.8°F), -12.2 to -16.7°C (10 to -1.9°F), -6.6 to -1.2°C (20 to 29.8°F) and -1.1 to 4.4°C (30 to 39.9°F) respectively, but the central distribution zone is in zone 9 and 8. Moso bamboo grows naturally in subtropical monsoon climate zone (in summer high temperatures and rainy; in winter cold and dry). The mean annual temperature varies from 15 to 21°C (59 to 69.8°F), with a mean temperature of the coldest month being 1 to 12°C (33.8 to 53.6°F), the mean annual minimum temperature ranging from -1.2 to -18°C (29.8 to -0.39°F), and that of the warmest month from 26 to 29°C (78.8 to 84.2°F). Moso bamboo can withstand -18 to -20°C (-0.39 to -4°F) in the winter. The annual precipitation is between 800 to 1800 mm (31½ to 71 inches). The restricting factors for Moso distribution are the annual precipitation (800 mm or 31½ inches) and minimum temperature in winter in the north, and drought in spring in the south. Spring drought makes shooting difficult.

Rainfall

Rainfall is also a key factor for Moso bamboo growth. It is optimal for Moso bamboo when the rainfall reaches 400 to 600 mm (15¾ to 23½ inches) by shooting time. **March to May** is the fast growth time for shoots and new culms, so there is a need for a vast amount of water in this period. In the Moso bamboo central distribution zone, rain season, the time of shooting and new culm growth coincide. **July to September** is the time of rhizome growth and shoot bud division. During a drought, few shoot buds will divide and conduct; c hoots will develop in the next spring.

The most suitable soil conditions: Over 60cm (23½ inches) deep fertile loam; pH = 4.5 to 7.0; moist but not soaked.

Introduction of Moso to the West

Moso bamboo was introduced into Japan in 1736, Europe in 1880 and the United States in about 1890. Now, more than 50,000 ha (123,550 acres) of Moso bamboo forest grows in Japan. Moso bamboo can be planted by transplanting mother bamboo or planting seedlings. A grove can be formed after about 5 years of transplanting mother bamboo, but it will take about 10 years to establish a grove with 10 to 12cm (4 to 4¾) culm diameter from a planted seedling. In Italy, the Moso bamboo grove planted from the seedlings of 1984, reaches 12cm (4¾ inches) in diameter.

A hectare of Moso bamboo forest can produce 6 to 10 t/yr fresh culms, 5 to 8 t/yr bamboo shoots. The record annual yield was 37 t/ha of fresh culms. The optimal density of Moso forest is 4,000 culms/ha (9,900 culms/acre) for timber

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Chinese Moso continued...

production and 2,500 culms/ha (6,000 culms/acre) for bamboo shoot production. The harvest age depends on its use; 7 years old for timber; 4 years for pulp and paper. Apart from this, in China, the young Moso culm less than one year old has been used to make traditional paper, which has been used for religious paper, calligraphy paper and the reprinting of ancient books.

There are various objectives of planting Moso bamboo:

1. For timber – bamboo timber can be used as building material, furniture, handicraft, and bamboo plywood. Bamboo house, pavilion, tower, bamboo scaffolding.
2. For bamboo shoots – fresh shoots, dry shoots and processed bamboo shoots in cans.
3. For timber and shoots.
4. For soil and water conservation.
5. For landscaping.
6. New products such as bamboo juice, bamboo beer, bamboo vinegar, bamboo charcoal, etc.

Moso bamboo groves can be planted using seedlings or mother bamboos.

Some major points for breeding Moso seedlings:

- Collecting Moso seeds in August to October
- Storing at room temperature for 2 to 3 months, not more than 6 months, but over one year at 0 to -5°C (23°F).
- Sowing after seed collection, or from March to April to avoid the lower temperature influence at winter.
- Pre-treating seeds before sowing. For example, washing seeds with clean water, then sterilizing them in 0.3% potassium permanganate (K_2MnO_4) solution for 2 to 4 hours and washing then again.
- Dibbing seeds into the holes with a diameter of 5 to 6cm (2 to 2 1/3 inches) and a depth of 2 to 3cm (3/4 to 1 1/4 inches) in a spacing of 30 to 40cm (11 3/4 to 15 3/4 inches), sowing 8 to 10 seeds in a hole and covering the seeds with smoked soil or tiny soil, finally covering the seedbed with straw and spray water to keep them wet.
- Sowing 22.5-30 kg/ha, their seedlings can plant for an afforestation of 800 ha with a spacing of 5x5m or 25m².

The one-year-old seedlings tiller and grow thickly, while the two-year-old ones have side buds. Both one and two year old seedlings sprout more and more seedlings, some of which sprout out seedlings, or grow into the soil and develop horizontally there as short rhizomes. The tops of the short rhizomes grow up from the soil again to form seedlings, so that the seedlings above the ground like a mixture type of bamboo. Triennial seedlings shoot out many rhizomes, whose buds sprout from the soil and grow up into seedlings, and these seedlings above the ground show a monopodial type. One to two-year-old seedlings have a strong tillering property, which can be used for propagation.

Two to three-year-old seedlings are used for afforestation and can be planted (Fig. 1). A clump with 3 to 4 culms, 1/3 leaves and branches and very tiny roots, should be cut off to reduce water loss of Moso seedlings.

Planting seedlings has many advantages, such as easy digging, transporting and planting, strong suitability, high survival rate

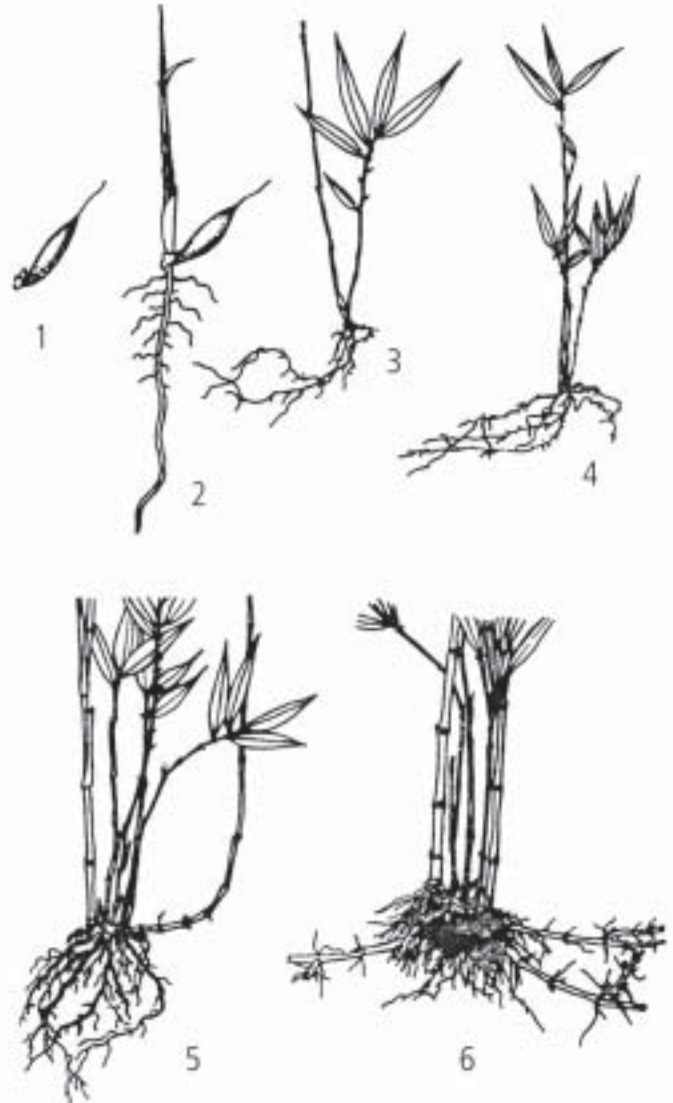


Fig.1 – Moso bamboo seed and seedlings. (1) seed, (2-3) seed germinating and growth, (4) 1-year-old seedling, (5) 2-year old seedling, (6) 3-year old seedling.

and low cost. However, it does take about 12 to 20 years for a seedling grove growing up to its ultimate size.

Planting by Transplanting Mother Bamboo

This method only takes about 5 years to form a Moso bamboo grove to reach the normal size.

The major points are as follows:

- Selecting 2 to 3 years old mother bamboo with 3 to 6cm (1 1/4 to 2 1/3 inches) diameter at breast height,
 - 30cm (11 3/4 inches) of rhizome that is approaching the culm,
 - 50cm (19 1/2 inches) of rhizome going away from the culm,
 - retaining enough host soil with 4 to 7 pairs of branches and cutting off the other branches.
- (See Fig. 2 on following page)

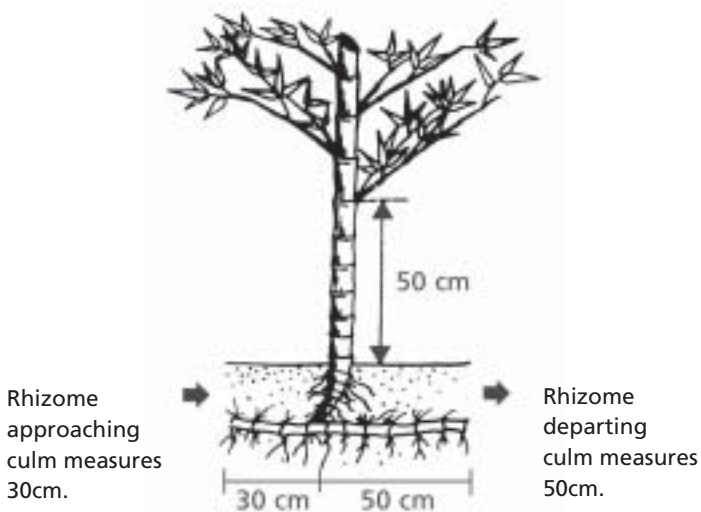


Fig.2 – Planting by transplanting mother bamboo.

Uses of Moso

Chinese people do not regard bamboo as a grass. In China, man names Moso bamboo culms as bamboo timber. Moso bamboo has another Chinese name: “Nan Zhu”. *Nan* in Chinese means a very valuable hardwood, so Nan Zhu is also a kind of very valuable timber. As timber, Moso bamboo has various uses since ancient times. It has been used as material in house and bridge building, and nowadays scaffolds still reach up to 40-storey skyscrapers. Furniture and ware of Moso bamboo are very popular in China: bamboo chopsticks, cradles, beds, mats, baskets, handles, carrying poles, and many other things besides. Bamboo handicrafts and musical instruments are very common. Before the invention of paper making, Moso bamboo slips were even used for writing on. Later, Moso bamboo has been used up to now for making pulp and paper. A special paper for Chinese painting and calligraphy has until now also been made from Moso bamboo.

Nowadays, due to the lack of timber, great efforts are being made for substituting Moso bamboo for conventional timber. A great amount of progress with Moso bamboo has been made with its industrial uses. For example, Moso bamboo plywood is used daily for the flooring of trucks, trains and containers. Since 1990, Moso bamboo flooring has even been exported to Japan, America, Europe and Australia. Several factories are producing bamboo beer, a beverage made from Moso bamboo juice. Bamboo charcoal is used for food, dyes and medical industries. Today, mankind plans to plant more Moso bamboo for carbon sequestration to mitigate greenhouse gas carbon dioxide. Bamboos, including Moso bamboo, are being studied as a renewable energy. In Germany for instance, bamboo bio-oil was produced in laboratory.

Bamboo shoots are a beloved food in China and other Asian countries. From March to May Chinese people eat spring shoots. Man digs winter shoots in winter and rhizome shoots (the tender tip of a growing rhizome) in autumn. Naturally, bamboo forests are also a good environment for the living, rest and recreation at leisure of mankind. ■

The Cultural Significance of *Guadua angustifolia* in Colombia

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In America, evidence of human use of bamboo has been found dating from the pre-Columbian period. The Valdivia, Machalilla and Chorrera cultures from Ecuador (Moran, 2001), and Calima, Tumaco and Quimbaya from Colombia present a great variety of vessels made with clay that represent houses and temples built with bamboo. The oldest evidence is from the Santa Elena Peninsula, Ecuador (Moran, 2001), and is dated 9,550 years before the present.

In Colombia, various native and rural communities, to satisfy basic necessities, have used *Guadua angustifolia* for shelter, fuel, and transportation as well as the creation of musical instruments, arts, and crafts (Judziewicz et al., 1999). Many of these multiple uses, developed historically, are still current.

Colombia is located in the tropical region from 4° of latitude South to 12° of Latitude North. It has an area of 1,141,748 km² (440,714 miles²) equivalent to 4.5 times the size of the state of Oregon, with a total population of 36 million inhabitants.

Colombia is crossed by the Andes System, here separating into 3 parallel ranges: Cordillera Oriental (extending into NW Venezuela), Cordillera Central (Central Colombia), and Cordillera Occidental (West Colombia). The highest peak is Cristobal Colon with an altitude of 5,797m (19,020 feet).

It is an area with a high level of volcanism and a high risk of seismic events, being located between two continents, three tectonic plates and two fire circles. Several earthquakes have affected the country during the last 200 years. The most recent one was in January 1999 in the Coffee Region of Colombia.

Colombia is one of the three richest countries of the World in biodiversity, with 50,000 species of plants. It is also the second highest country in Latin America in diversity of bamboo. At present, 19 genera and 95 species are reported, with 24 species being endemic.

The botanists Humboldt and Bonpland identified *Guadua angustifolia* as *Bambusa guadua* first; they collected this bamboo in their trip to the New World early in the XIX century. Later, in 1822 the German botanist Karl Sigismund Kunth furthered the studies of this bamboo and created the genus *Guadua*, using the word “guadua” from the native Colombian and Ecuador communities. Kunth re-baptized the species with the name *Guadua angustifolia*, where the specific epithet means “narrow leaf” (Londoño, 2000).

Guadua angustifolia is found in its natural state in Colombia, Ecuador and Venezuela, and it has been introduced to several Central America countries, the Caribbean Islands, Mexico, La Florida, Hawaii, Indonesia, Thailand, China, Switzerland and others.

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